

systems.¹⁹ The effect of all other variables on the rate charged is assumed to be the same for both sets of systems. On the basis

Commission. As serious as these problems are, they would likely be amplified if the Commission were to go forward with its proposal to base its benchmarks on an analysis that deletes the low-penetration systems from the sample. We discuss this issue in more detail in the next section.

1. The Commission's Sample

The first factor to consider in evaluating the Commission's approach is the size and nature of the sample it employed. As noted above, the sample that was actually used to estimate the competitive differential contains data for only 377 community units, despite repeated references in the Commission's technical appendix to 1,107 units, which are all units for which data were obtained, and 687 units, which are all "first" units for which data were obtained. In fact, many observations were deleted to obtain the sample that was finally employed.

In addition, it should be noted that the sample contains observations for only 110 competitive units among the 377 observations that were used to estimate the Commission's equation. Of these, 64 were low-penetration units, 31 were overbuilt units, and 15 were "municipal" units. Moreover, our analysis of the data

indicates that there were only 101 different competitive systems in the sample.²⁰ Of these, 58 were low-penetration systems, 29 were overbuilt systems, and 14 were "municipal" systems.²¹

The Commission was apparently initially concerned about the possibility that a random sample of all systems would result in only a relatively small proportion of large systems. Because most subscribers are served by large systems, the Commission initially "oversampled" such systems "to compensate for the small number of large systems likely to appear in a random sample."²² However, as noted, the Commission did not use observations on these systems in its analysis except in the small number of instances where they

²⁰Some of the "second" units were apparently for different systems than some of the "first" units. As a result, the number of "second" units is not simply the difference between the number of independent systems and the number of "first" units.

²¹The argument for including "second" units in the sample is presumably that they contain information that is not present in the "first" units. There are two responses to this argument. First, it seems likely that data for the second units will often duplicate the data for the first, so that the apparent increase in the number of observations may be spurious. Second, if, in fact, the second-unit data do contain additional information, these data should be included for the non-competitive as well as the competitive systems.

²²In the Matter of Implementation of the Cable Television Consumer Protection Act of 1992: Rate Regulation, Order, Adopted December 10, 1992, para. 3. Presumably, the reason for initially oversampling the larger systems was to reflect the fact that it is subscribers, not systems, that rate regulation is designed to serve. Because the population of cable systems contains a disproportionate share of systems with relatively few subscribers, a random sample of all systems will contain many of these small systems. That is, most of the systems included will not be of the kind to which consumers actually subscribe. To make the sample more representative of the universe of systems to which consumers actually subscribe, one would oversample the larger systems. Why the Commission deleted these observations is puzzling.

were identified as effectively competitive. The following Table reports the number of units in the Commission's sample in a number of system subscriber size categories.²³

<u>System Subscribers</u>	<u>Units</u>	<u>Competitive Units</u>
< 1,000	122	45
1,001-3,500	72	19
3,501-10,000	53	8
10,001-50,000	80	21
> 50,000	50	17

It is also notable that there are only about 2,600 subscribers to the system of the median unit in the Commission's sample and only about 1,400 subscribers to the system of the median competitive unit.

While the number of effectively competitive observations is not unusually "small" in the conventional statistical sense, it is small given the purpose for which the Commission will be using the data. The Commission is using the behavior of 110 community units to determine the benchmark rates for 33,000 community units. As

differential and its precision. In larger samples, such unusual observations would tend to be offset by other more typical observations.

2. The Commission's Equation

Stripped to its essentials, the approach taken by the Commission involves using the rates charged by the effectively competitive systems to determine the rates that can be charged by systems not subject to effective competition. The only role of the other variables in the Commission's equation is to control for differences between the two types of systems other than their competitive situations.

The Commission's estimate of the competitive differential is based on two implicit and apparently untested assumptions. First, the Commission implicitly assumes that the only factor that causes rates to differ between competitive and non-competitive systems is the presence or absence of effective competition. All other factors are assumed to have the same effect on the rates for both types of systems. Thus, for example, the effect of a change in the number of satellite channels on the rate per channel is the same whether or not a system is effectively competitive.

One way to determine whether this critical assumption is statistically correct is to estimate an equation that pools data from both competitive and non-competitive systems and allows the coefficients as well as the intercepts to differ between the two types of systems. By comparing the explanatory power of the two

equations, or by comparing coefficients directly, one can test the

hypothesis that the regression coefficients are equal. 24

competitive systems, it cannot be certain that the specification it has employed to estimate the competitive differential is not seriously in error. If the behavior of competitive systems differs significantly from that of non-effectively competitive systems for reasons other than the mere presence or absence of effective competition, the Commission's equation is misspecified and its estimate of the competitive differential may be in error. However, the Commission has apparently not examined this possibility.

The Commission's second implicit assumption is that the same equation explains the variance in rates for all cable systems regardless of the number of subscribers that the systems serve. That is, by estimating a single equation for all systems regardless of the number of subscribers they serve, the Commission has assumed that the effect on cable rates of the number of channels, the number of satellite services and, importantly, the magnitude of the competitive differential is the same for all cable systems.²⁶ In fact, the effect of any one or all of these variables on subscriber rates may depend on the number of subscribers served by the system, leading to another source of potential error in estimating the benchmark rates.²⁷

²⁶The previous point considered possible differences between the equations that explain rates for competitive and non-competitive systems. This point refers to differences in the equations for systems with different numbers of subscribers regardless of whether or not they are competitive.

²⁷We are aware, of course, that the Commission has included the number of subscribers as an explanatory variable in its

An alternative, which is not subject to this problem, would have been to estimate "fixed weight" price indexes. Under this approach, a representative "market basket" of services and equipment would be specified and the cost of that market basket would be determined for each system. As a result, differences in the amounts of service and equipment taken by subscribers to different systems would not affect the rate comparisons. Importantly, this approach could lead to a different estimate of the competitive differential.

Even if the Commission's approach to determining rates is accepted, however, there is an additional problem. The FCC has reported that there were many shortcomings in the equipment data it received. As a result, the Commission was forced to make estimates of equipment revenues in developing the data used to estimate the competitive differential. What is perhaps not fully realized is that small errors in making these adjustments can have a significant impact on the estimated competitive differential.

Consider an effectively competitive cable system that offers 10 channels of cable service and charges \$20 for service and equipment, for a price of \$2 per channel. Now consider a cable system that does not face effective competition, that also offers 10 channels of service, and that actually charges \$15 for cable service and \$7 for equipment. If the information about both systems is reported accurately, the competitive differential will be calculated as $((\$15 + \$7)/(\$20)) - 1.00$, or 10 percent. Suppose, however, that the rate for equipment for the second of the

systems is estimated by the Commission at either \$6 or \$8. In the former case, the estimated differential is $((\$15 + \$6)/(\$20)) - 1.00$, or 5 percent. In the latter case, the estimated differential is $((\$15 + \$9)/(\$20)) - 1.00$, or 20 percent. Estimates that are half as large, or twice as large, as the "true" differential can result from what appear to be relatively small errors in the estimates of equipment rates.

The Commission has indicated that it was able to correct for deficiencies in the equipment data in 50 out of 64 cases in which the equipment data appeared to be incorrect.²⁹ Our own experience with the equipment data in the Commission's original database suggests a far larger number of observations in which the equipment data are questionable, and far greater difficulty in correcting for these deficiencies using data that were submitted by respondents. We thus remain highly skeptical that the data accurately reflect the rates that are actually being charged.

4. Summary

In short, there are at least four major concerns about the Commission's estimates of the competitive differential: (1) the

number of subscribers they serve; (3) the number of effectively competitive svstems in the Commission's sample is small relative to

IV. Testing the Commission's Untested Assumptions

We have attempted to overcome the first and second of the shortcomings described above, both of which involve possible misspecifications of the Commission's equation, and we report the results of doing so below. However, the problem of the small number of observations for competitive systems cannot be overcome. Nonetheless, we have pursued the other approaches discussed below because of our concerns about the limitations of the effective competition method.

Our principal objective in employing the effective competition method is to address the problems we have identified above regarding the way in which the FCC has employed that method. Thus, we have used the Commission's revised data. In addition, we have accepted the Commission's adjustments for equipment costs although we remain skeptical about them. We have also adopted the basic functional form employed by the Commission. Finally, we have not taken account of variables that might help explain the variance in rates but which were not used by the Commission in its reported equation. In short, we have followed as closely as possible the FCC's basic approach to sample selection, data construction, and estimation, while attempting to determine the effects of modifying some of the implicit assumptions the Commission has made in its statistical analysis.

We first compared the rates charged by effectively competitive cable systems to the rates charged by non-effectively competitive systems in each of the five GAO subscriber categories, taking into

account differences in the total number of channels offered, the number of satellite services offered, and the number of subscribers served -- the same variables considered by the Commission. We estimated equations that are identical to those estimated by the Commission as well as ones that allow for differences in the slope coefficients of the equation between competitive and non-competitive systems.

When we estimated the Commission's basic equation for the different subscriber size classes, we obtained results that are, in many respects, quite different from those obtained using the

have higher rates than do non-competitive units for the 10,001-50,000 subscriber category. Second, only two of the estimated competitive differentials, those for the two smallest size categories, are statistically significant at the confidence level employed by the Commission. In short, the Commission's estimate of a single competitive differential, 10 percent, masks considerable heterogeneity among system classes. The range about the Commission's estimate is quite large and the estimated differential is not statistically significant for 3 of the 5 subscriber classes.

Next, we analyzed the effect of allowing the slope coefficients as well as the intercepts to differ between competitive and non-competitive systems. This involved estimating the equations with the addition of variables that are the product of the (binary) competitive variable and each of the other explanatory variables. The following Table reports the results of F-tests that indicate whether the addition of these variables significantly reduces the unexplained variance in the rate equation.

System Subscribers

F-Statistic

The most important thing to observe about this Table is that for two of the subscriber size classes, an equation that allows the slope coefficients as well as intercepts to differ between competitive and non-competitive systems results in a significant reduction in the unexplained variance. Moreover, the F-statistic for the largest subscriber class is only slightly short of being significant. This suggests that, for two or three of these size classes, the Commission's equation may be misspecified. Identifying a single competitive differential that applies to all systems even with a given subscriber size class may not be appropriate.

In addition, we examined the hypothesis that an equation in which observations were assigned to size classes, and both the intercepts and slope coefficients were permitted to differ between competitive and non-competitive systems within a given size class, explained a significantly larger proportion of the variance in rates than did the Commission's equation. We found that it did.³⁰

Finally, we estimated the Commission's rate equation using only observations for the effectively competitive systems. We also permitted the coefficients of the independent variables (the intercept, the reciprocal of system subscribers, the (log) of the total number of channels (subscriber-weighted), and the (log) of the number of satellite channels (subscriber-weighted)) to vary with the number of system subscribers. We then used that regression to predict what the service rates of the non-effectively competitive systems would be if they were effectively competitive and came from the same population as the effectively competitive systems. We then compared the predictions to the rates currently being charged.

The results highlight how fragile the estimates are of the competitive differential that are based on the competitive observations. For small non-effectively competitive systems, the regression tends to predict that most of the effectively competitive rates are less than the current "non-effectively competitive" rates. For systems with between 10,000 and 50,000 subscribers, however, the predicted "competitive" rate exceeds the current rate in 78 percent of the cases.

<u>System Subscribers</u>	<u>Percent of Non-Effectively Competitive Systems For Which the Effectively Competitive Rate Exceeds the Current Rate</u>
< 1000	14.2
1,001-3,500	6.9
3,501-10,000	19.7
10,001-50,000	78.1
> 50,000	18.5

V. Accounting for Equipment

As previously noted, the Commission asserts that it is unable to adjust its data for equipment costs for only a small number of observations. Thus, the Commission obtained 377 observations whose service rates were equipment-adjusted. By contrast, when we applied a number of reasonable screens to the data to filter out those observations that appeared to us unreliable, our final dataset consisted of only 123 observations.

Our approach differs in two ways from that of the Commission. First, we assumed that all subscribers required cable installation and that the life of a typical subscriber was three years. We accounted for installation costs by amortizing the one-time cost of the installation "services" over that three-year period (at an interest rate of 8 percent). By contrast, the Commission accounted for installation costs by calculating current installation revenues (divided by the number of subscribers). While there should be little or no difference between the two approaches in "steady

state," relatively new systems will be adding new subscribers more rapidly than more mature systems. The more rapidly growing systems will thus appear to have higher revenue per subscriber than the mature systems. Because it seems to us likely that the newer systems are also non-effectively competitive systems, the average rate of the non-effectively competitive systems will be artificially higher than those of the effectively competitive systems simply because the Commission did not adjust its calculations to account for systems at different stages of growth. Thus, part of the Commission's estimated competitive differential may be a result of this artifact.

Second, in light of the apparent sensitivity of the estimated competitive differential to errors in equipment costs, we chose not to make any crude estimates of equipment revenues at the community unit level using system-wide equipment revenues. Specifically, we used only those observations for which the number of converters, number of remotes, and number of additional outlets was each non-zero. Our experience suggested that virtually every cable franchise offers its subscribers converters, remotes, and additional outlets. Thus, for any cable franchise that did not provide some data for each of these equipment categories, those data were likely to be in error. Finally, because cable-ready sets or VCRs are in far from universal use, we also required that at least 10 percent of all franchise subscribers have converters.

While we believe that these screens are reasonable and tend to result in more accurate estimates of equipment-adjusted rates, they

nonetheless resulted in a dataset of only 123 non-effectively competitive observations, far smaller than that of the Commission, and in equipment-adjusted service rates that appear to be quite different from those of the Commission. As detailed in the Table below, our estimates of the adjusted rate differ considerably from those of the Commission, being an average of as much as 21 percent lower than the Commission's and as much as 13 percent higher for various system size classes. As we noted above, this confirms that even small errors in the estimation of equipment revenues can have substantial effects on the estimated competitive differential.

<u>System Subscribers</u>	<u>Extent to Which Our Estimated Rate Is Lower than (-) or Exceeds (+) the FCC Rate³¹ (Percent)</u>
< 1,000	-17
1,001-3,500	-21
3,501-10,000	-13
10,001-50,000	+5
> 50,000	+13
Average	+5

VI. Alternative Measures of the Effectively Competitive Differential

Because we conclude that the Commission's estimate of the competitive differential is very sensitive to both statistical and

³¹All individual rates within each system subscriber group were weighted by the number of franchise subscribers.

data issues, we examined an alternative estimate of the differential based on the GAO sample against which the Commission might compare its own estimate. Such a comparison might inform the Commission as to the likelihood that the "true" differential exceeds that estimated by the Commission. Our approach simply calculates an estimate of the "effectively regulated" differential, i.e., the percent difference between the 1986 basic rates charged by regulated cable systems and those charged by unregulated systems. As the Table below reveals, regulated systems charged between 4 and 10 percent below their unregulated counterparts, with the average difference being about 5 percent.

<u>System Subscribers</u>	<u>Effectively Regulated Differential</u> ³²
	(Percent)
< 1,000	5
1,001-3,500	4
3,501-10,000	5
10,001-50,000	4
> 50,000	10
Average	5

While this approach does not resolve any of the difficulties associated with the Commission's estimate of the competitive

³²This column refers to the percentage rate reduction required for unregulated rates to equal regulated rates. The underlying data source of these estimates is the General Accounting Office, National Survey of Cable Television Rates and Services, August 1989, Tables III.11 and III.12.

differential, it does suggest that, on average, the estimated "true" differential is likely to be closer to the 10 percent differential than to a much higher number.

VII. Should Low Penetration Systems be Eliminated from the Analysis?

The Commission has indicated that it is considering whether to eliminate systems with penetration rates below 30 percent from its sample of effectively competitive systems and to recalculate the competitive differential. Apparently that would increase the differential to about 28 percent, leading to further reduction in the benchmark rates for cable systems that are not subject to effective competition.

The reasoning behind the Commission's consideration of whether to eliminate the low-penetration systems from its analysis is both clear and incomplete. The Commission apparently believes that some systems may have low penetration for reasons other than the fact that they face effective competition. That is, the Commission is considering whether the rates charged by these systems are, in fact, indicative of the rates that would be charged by systems that did face effective competition. Even if the Commission were justified in deleting the low-penetration systems, this does not mean the Commission should rely solely on the remaining observations. Instances of overbuilding may be unsustainable, because the rates being charged are insufficient for both systems to cover their entire cost, so that observed rates may reflect

disequilibrium behavior. Municipal systems may charge low rates because they can avoid costs that must be incurred by private firms, or because they can shift costs elsewhere in the municipal budget.

In the short run, overbuilt systems can coexist so long as both obtain revenues that exceed their variable costs. However, in the long run, i.e., when all costs are variable, one of the systems may fail, or the systems will merge, unless rates at least equal total costs.³³ Although the rates observed during the short run are the result of competition, if they are not sufficient to cover total costs, they will not equal long-run competitive equilibrium rates. As a result, these rates will be poor benchmarks for systems that are not subject to competition.³⁴

This discussion indicates that obtaining appropriate competitive benchmarks by observing the market behavior of cable systems is likely to be difficult. However, selectively eliminating observations for low-penetration systems because they may not involve truly competitive rates is not the solution to this problem. The reason is that the remainder of the sample, overbuilt and municipal systems, contains its own difficulties. Removing observations on systems with rates that are thought to be "too high" is no solution if the remaining systems have rates that are

³³Their ability to do so will depend on the nature of competition between them, which, in turn, will depend, in part, on the extent to which the systems offer differentiated services.

³⁴The Commission recognizes the same point when it notes that the prices of some community units "may be below cost and may not be sustainable in the long run." Appendix E. p. 13.

"too low." That is why it is important to consider other methods for determining the competitive benchmarks as a "check" on the Commission's estimate.

If the Commission were to base its estimate of the competitive differential on a sample that contains only those "effectively competitive" systems that compete with multichannel providers, or are in markets where the municipal franchising authority provides multichannel service, that sample reconstruction would not resolve and, indeed, might magnify the fragility of the current estimate. Most importantly, there are simply too few such effectively competitive systems to provide a reliable benchmark. As we noted above, the database used by the Commission to estimate the competitive differential contained only 31 "overbuilt" units and only 15 "municipal" units. Moreover, these figures overstate the number of independent observations on competitive systems. As we noted above, for example, there are only 29 separate overbuilt systems in the Commission's sample, a number that is clearly too small to be used as the sole basis for regulating cable subscriber rates.

For the sample excluding low-penetration systems, we have conducted the same analysis of the Commission's equation as reported above for the entire Commission sample. We first estimated the Commission's equation for separate size classes. As the following Table indicates, the estimated competitive differential, far from being a single stable value across size classes, varies widely, from as low as 7 percent to as high as 50

percent. Moreover, the competitive differential is not significantly different from zero for two of the system size classes. This suggests that the Commission's basic equation, in which the competitive differential is assumed to be the same for all systems, is also seriously misspecified when the restricted database is used.

<u>System Subscribers</u>	<u>Competitive Differential</u>
< 1,000	-.37*
1,001-3,500	-.50*
3,501-10,000	-.20
10,001-50,000	-.07
> 50,000	-.20*

* Significant at the 95 percent confidence level.

As in the analysis of the entire sample, we also allowed the slope coefficients as well as the intercepts to differ between competitive and non-competitive systems for each subscriber class.

<u>System Subscribers</u>	<u>F-Statistic</u>
< 1,000	.32
1,000-3,500	.87
3,500-10,000	2.65
10,000-50,000	3.20*
> 50,000	3.35*

* Significant at the 95 percent confidence level.

Here, the results are similar to those when all observations are included. For two of the five size classes, an equation that permits the slope coefficients to differ between competitive and